

## LISTS OF SPECIES

### Hydrozoa, La Ciotat and nearby areas, Mediterranean coast of France.

Horia R. Galea

*Huinay Scientific Field Station. Casilla 462, Puerto Montt, Chile.*

*E-mail: h.galea@laposte.net*

**Abstract:** The shallow-water hydrozoan fauna of La Ciotat and nearby areas, Mediterranean coast of France, was surveyed over a period of 6 years; 41 species, belonging to 10 families of Athecata and 13 families of Thecata were identified.

#### Introduction

The hydrozoan fauna of the Mediterranean is one of the most studied and documented in the world. Picard (1958b) made the first list of both athecate and thecate hydroids and their medusae known up to date from that sea, and found 191 species. Later on, Boero and Bouillon (1993) updated the list, including the other members of the Hydrozoa, except the siphonophores, and found 349 species. Subsequently, Boero et al. (1997) raised their number to 379, and finally siphonophores were added to the list, to reach about 457 species (Bouillon et al. 2004).

Fundamental studies on the Mediterranean Hydrozoa were carried out at the main marine stations located in Italy (Naples, Trieste, Messina), Croatia (Rovinj, Split), Spain (Barcelona) and France. For a historical review and an extensive bibliography on the subject, see Bouillon et al. (2004).

On the Mediterranean coast of France, researches were undertaken at Banyuls-sur-Mer (Motz-Kossowska 1905; 1911; Picard 1951a; 1952b; Razouls and Thiriot 1968; Redier 1962), Villefranche-sur-Mer (du Plessis 1888; Leloup 1934; Picard 1951b; 1955; 1958a; 1960), and Endoume (Marseilles). In the latter case, the studies were oriented towards the distribution and ecology of the hydromedusae (Albertini-Berhaut 1971a; 1971b; Berhaut 1969 a; 1969b) and the benthic hydroid fauna of the littoral zone (Marinopoulos 1979; 1988; Picard 1965) or deeper waters (Marinopoulos 1981). Some studies were also extended to non-littoral areas, e.g. the Caronte channel (Picard 1950a).

More general studies on the hydroids of the French Mediterranean coast are available in Picard (1950b; 1952a; 1952c). However, the hydrozoan fauna of this region remains relatively

poorly known, and additional data are much needed in order to gain a more detailed and comprehensive knowledge. Here is provided a list of hydrozoans from La Ciotat and nearby areas.

#### Material and methods

##### *Study site*

La Ciotat is the second largest suburb of the city of Marseilles (southern France), and is situated at about 32 km southeast of it. On the west side of the city, the littoral is highly structured and presents a number of coves, creeks (e.g. Mugel and Figuerolles), and one small island, the Green Island. The relief is characterized by steep slopes, both under and above the water line. The cliffs are composed of pudding stones, a conglomerate made up of pebbles of varying size, cemented together by a fine mineral deposit. This geological formation is supposed to originate from deposition of the alluviums of an ancient delta (Guieu et al. 1996).

The submerged part is characterized by the frequent occurrence, at shallow depths, of faults, cavities and overhangs. These geological structures are populated by flourishing benthic communities, mainly found between 20 and 40 m depth, and represented by sessile filtering organisms, such as scleractinians, gorgonians, sea anemones, sponges, bryozoans and ascidians (Harmelin 1997). In addition, the biotopes are also composed of numerous species of fishes, crustaceans, mollusks, echinoderms etc. Despite a strong anthropic pressure due to human activities, the marine fauna is very rich in this sector (Bonhomme et al. 2001).

On the other hand, the shallow-water biotopes are most often submitted to wave action, and are mainly characterized by the presence of algal communities (Chromophyceae, Fucophyceae, Rhodophyceae), with their associated sessile or vagile microfaunas (Bonhomme et al. 2001).

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Additionally, on the east side of La Ciotat, there is the Gulf d'Amour, which harbors sandy beaches, gently sloping underwater. The submarine environment is characterized by the presence of large *Posidonia oceanica* meadows, which constitute one of the most important littoral ecosystems in the Mediterranean (Molinier and Picard 1952; Boudouresque et al. 1994).

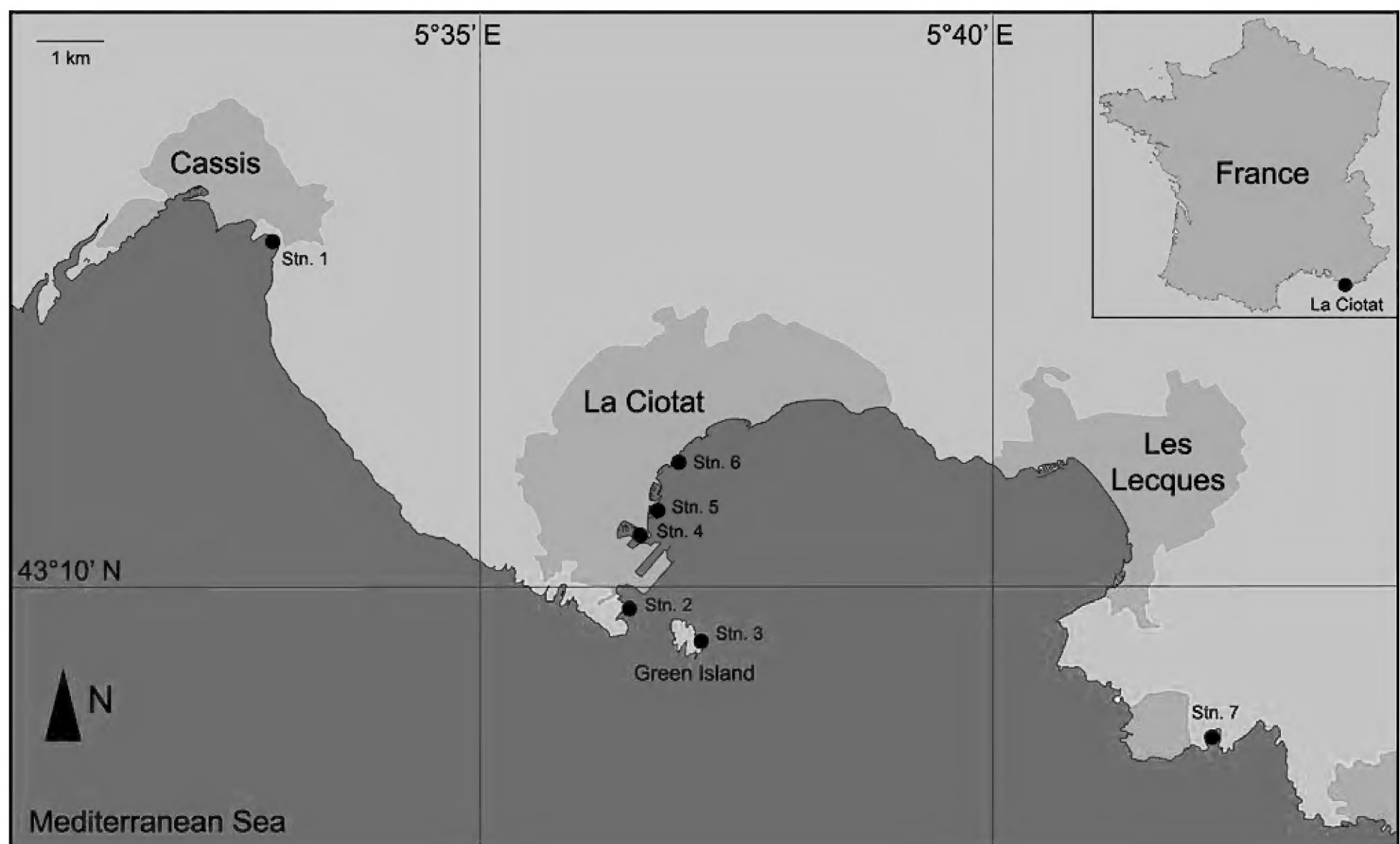
### Harvesting procedure

The hydroid material was collected by snorkeling from depths between 0-2 m. Besides the macroscopic hydroid colonies removed directly from rocks and organic concretions, other substrates (algae, sponges, ascidians, mollusk shells etc.) or human-made objects (ropes, buoys, wharf pilings etc.) were examined for the presence of animals. The medusae were collected by towing a plankton net (opening diameter of 55 cm, mesh size of 250  $\mu$ m), either vertically or horizontally, at different depths (20-0 m), from jetties or a boat (speed of 2-4 km/h). The collected specimens were studied alive and the taxonomic identifications were made on the literature specified in the references. Specimens were fixed in 4 % formaldehyde and

preserved in 70 % ethanol. Permanent microslide preparations were made from parts or whole colonies using classical methods.

### List of stations

**Stn. 1:** Arena Beach, Cassis, 43°12'28" N, 5°32'58" E, *Posidonia oceanica* meadows, 1-2 m. **Stn. 2:** Mugel creek, La Ciotat, 43°09'50" N, 5°36'27" E, hard substrates (rocks and concretions), 0-2 m. Epipelagic plankton collected between 5-0 m. **Stn. 3:** Green Island, off La Ciotat, 43°09'33" N, 5°37'10" E, epipelagic plankton (1-0 m). **Stn. 4:** Fishing port, La Ciotat, 43°10'22" N, 5°36'38" E, human-made hard substrates (docks, floats, wharf pilings, chains, ropes, buoys), 0-2 m. **Stn. 5:** Marina, La Ciotat, 43°10'29" N, 5°36'42" E, hard substrates (rocks and concretions), sponges, 0-2 m. Epipelagic plankton (2-0 m) and pleuston. **Stn. 6:** Main beach, La Ciotat, 43°10'57" N, 5°36'59" E, *Posidonia oceanica* meadows, 1-2 m. **Stn. 7:** Port d'Alon creek, near Bandol, 43°08'38" N, 5°42'17" E, hard substrates (rocks, concretions) and sponges, 0-2 m.



**Figure 1.** Map of studied area, with position of stations.

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### Results and discussion

During the present study, the area of interest (Figure 1) was explored between 2001 and 2006, most often during the summer months (August-September). However, a continuous survey was undertaken between September 2002 and March 2004.

At Stn. 1, the following hydroid species were collected: *Sertularia perpusilla* (viii.2002, sterile), *Orthopyxis mollis* (viii.2001, viii.2002, fertile), and *Obelia geniculata* (viii.2000, fertile).

At Stn. 2, the following hydroid species were collected: *Eudendrium racemosum* (viii.2001, 20-21.viii.2002, viii.2003, fertile), *Coryne muscoides* (viii.2003, sterile), *Aglaophenia acacia* (viii.2001, viii-ix.2002, fertile), *Aglaophenia kirchenpaueri* (viii-ix.2002, fertile), *Aglaophenia pluma* (viii.2001, viii.2002, fertile), *Antennella secundaria* (24.viii.2002, sterile), *Halopteris liechtensternii* (viii.2001, 20-21.viii.2002, fertile), *Anthohebella parasitica* (viii.2002, sterile), and *Clytia linearis* (viii.2001, 20-21.viii.2002, fertile). Samples of epipelagic plankton contained two species of hydromedusae, i.e. *Turritopsis dohrnii* (16.ix.2002, immature medusae) and *Clytia linearis* (ix.2002, young medusae).

At Stn. 3, samples of epipelagic plankton revealed the presence of *Aequorea forskalea* (03.v.2003, mature medusae) and *Laodicea undulata* (03.v.2003, mature medusae).

At Stn. 4, the following hydroid species were collected: *Bougainvillia muscus* (10.i.2003, fertile), *Lafoeina tenuis* (10.i.2003, sterile), *Eirene viridula* (01.xi.2003, sterile), *Kirchenpaueria halecioides* (12.i.2003, sterile), and *Sertularella polyzonias* (16.iii.2003, fertile). Specimens of *Nemertesia ramosa* (i.2003, sterile) and *Sertularella crassicaulis* (i.2003, sterile) found at this station were brought with the fishing nets, most probably from unknown, deeper stations.

At Stn. 5, the following hydroid species were collected: *Rhizogeton* sp. (06.iv.2005, 02.iv.2006, sterile), *Eudendrium ? merulum* (ix.2003, fertile), *Ectopleura wrighti* (10.x.2003, sterile), *Aglaophenia tubiformis* (24.viii.2002, fertile, 16.iii.2003, sterile), *Halecium mediterraneum* (ix.2002, fertile, 16.iii.2003, sterile), *Kirchenpaueria halecioides* (27.xi.2002, fertile), *Phialella quadrata* (16.iii.2003, sterile), *Sertularella polyzonias* (viii.2003, fertile), and *Clytia hemisphaerica* (09.v.2003, fertile). Epipelagic plankton and pleuston samplings yielded the following species: *Hydractinia minima* (31.iii.2003, with medusa buds), *Corymorpha nutans* (11.iv.2003, immature medusae), *Coryne eximia* (06.x.2002, immature medusae), *Velella velella* (11.iv.2003, fertile), and *Obelia geniculata* (30.xii.2002, 21.iii.2003, immature medusae).

At Stn. 6, the following hydroid species were collected: *Plumularia obliqua* (ix.2002, 16.iii.2003, sterile), *Dynamena disticha* (viii.2002, sterile), *Sertularia perpusilla* (20.xi.2002, 31.viii.2003, sterile), *Orthopyxis integra* (20.xi.2002, sterile), *Obelia geniculata* (viii.2001, viii.2003, fertile). The medusa stage of *Eleutheria dichotoma* (07.viii.2005, with medusa buds) was equally found on *Posidonia oceanica* leaves.

At Stn. 7, the following hydroid species were collected: *Turritopsis dohrnii* (20.ix.2003, sterile), *Coryne muscoides* (24.iv.2003, sterile), *Dipurena ophiogaster* (22.iv.2003, fertile), *Ectopleura larynx* (24.iv.2003, fertile), *Zanclaea sessilis* (18.x.2003, sterile), *Aglaophenia pluma* (24.iv.2003, 01.iv.2005, sterile), *Anthohebella parasitica* (24.iv.2003, sterile), and *Scandia gigas* (18.x.2003, sterile).

A list of all the species identified during the present study is given in Table 1. Forty one species, belonging to ten families of Athecata and thirteen families of Thecata, were collected.



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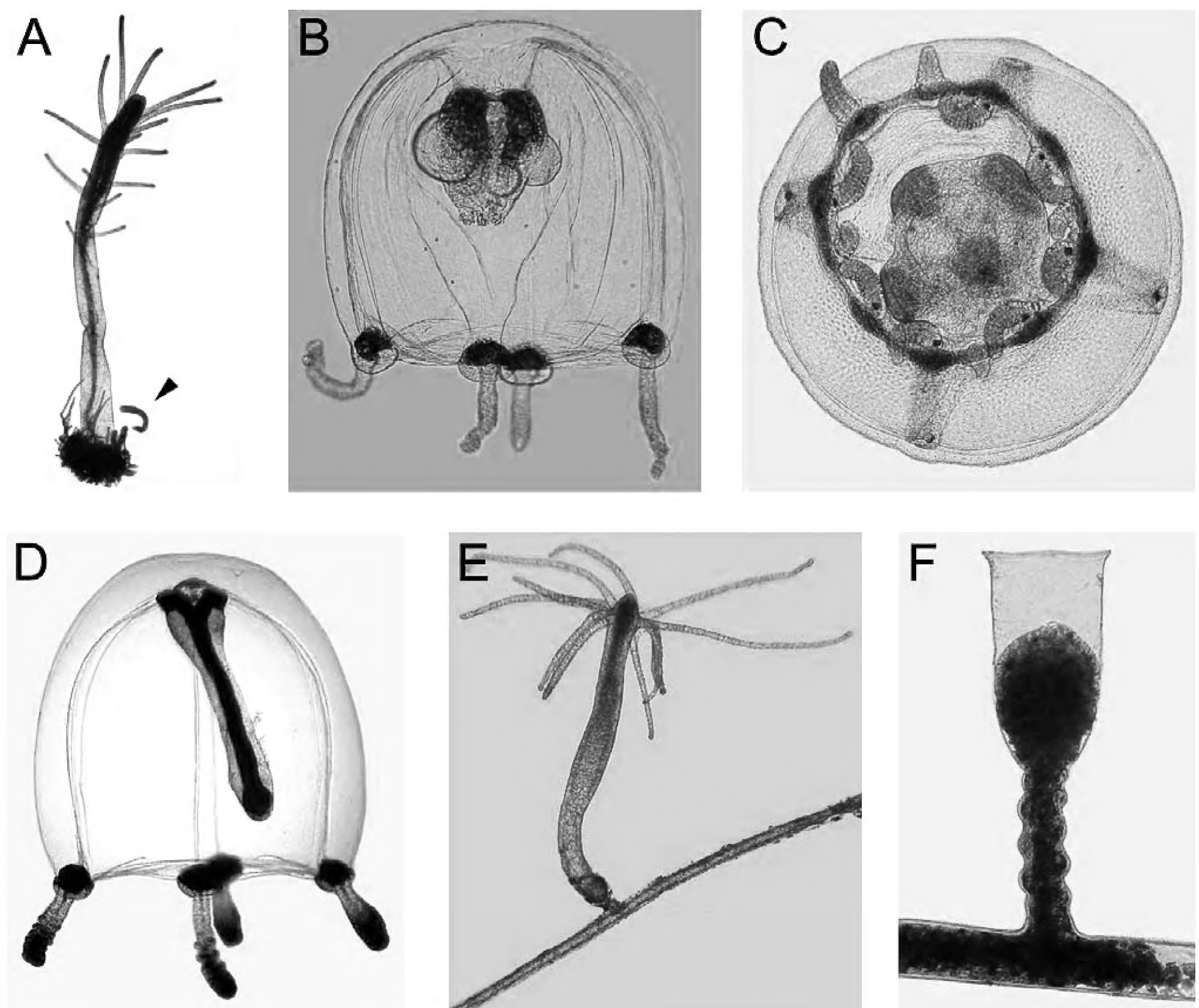
**Table 1.** List of hydroids and hydromedusae collected from La Ciotat and nearby areas. Records of both the polyp (P) and medusa (M) stages are indicated.

Subclasses, families	Genera, species	Stage(s)
<b>Subclass Anthomedusae Haeckel, 1879</b>		
Family Bougainvilliidae Luetken, 1850	<i>Bougainvillia muscus</i> (Allman, 1863)	P, M
Family Oceaniidae Eschscholtz, 1829	<i>Rhizogeton</i> sp.	P
	<i>Turritopsis dohrnii</i> (Weissmann, 1883)	P, M
	<i>Hydractinia minima</i> (Trinci, 1903)	M
Family Hydractiniidae L. Agassiz, 1862	<i>Eudendrium</i> ? <i>merulum</i> Watson, 1985	P
Family Eudendriidae Agassiz, 1862	<i>Eudendrium racemosum</i> (Cavolini, 1785)	P
	<i>Eleutheria dichotoma</i> Quatrefages, 1842	M
Family Cladonematidae Gegenbaur, 1857	<i>Corymorpha nutans</i> M. Sars, 1835	M
Family Corymorphidae Allman, 1872	<i>Coryne eximia</i> Allman, 1859	M
Family Corynidae Johnston, 1836	<i>Coryne muscoides</i> (Linnaeus, 1761)	P
	<i>Dipurena ophiogaster</i> Haeckel, 1879	P, M
	<i>Ectopleura larynx</i> (Ellis & Solander, 1786)	P
	<i>Ectopleura wrighti</i> Petersen, 1979	P
Family Tubulariidae Fleming, 1828	<i>Velella velella</i> (Linnaeus, 1758)	P
Family Porpitidae Goldfuss, 1818	<i>Zanclea sessilis</i> (Gosse, 1853)	P
Family Zancleidae Russell, 1953		
<b>Subclass Leptomedusae Haeckel, 1866</b>		
Family Aequoridae Eschscholtz, 1829	<i>Aequorea forskalea</i> Péron & Lesueur, 1810	M
Family Aglaopheniidae Marktanner-Turneretscher, 1890	<i>Aglaophenia acacia</i> Allman, 1883	P
	<i>Aglaophenia kirchenpaueri</i> (Heller, 1868)	P
	<i>Aglaophenia pluma</i> (Linnaeus, 1758)	P
	<i>Aglaophenia tubiformis</i> Marktanner-Turneretscher, 1890	P
	<i>Lafoeina tenuis</i> G. O. Sars, 1874	P
Family Campanulinidae Hincks, 1868	<i>Eirene viridula</i> (Péron & Lesueur, 1810)	P
Family Eirenidae Haeckel, 1879	<i>Halecium mediterraneum</i> Weissmann, 1883	P
Family Haleciidae Hincks, 1868	<i>Antennella secundaria</i> (Gmelin, 1791)	P
Family Halopterididae Millard, 1962	<i>Halopteris liechtensternii</i> Marktanner-Turneretscher, 1890	P
	<i>Anthohebella parasitica</i> (Ciamician, 1880)	P
Family Hebellidae Fraser, 1912	<i>Scandia gigas</i> (Pieper, 1828)	P
Family Kirchenpaueriidae Stechow, 1921	<i>Kirchenpaueria halecioides</i> (Alder, 1859)	P
Family Laodiceidae Agassiz, 1862	<i>Laodicea undulata</i> (Forbes & Goodsir, 1851)	M
Family Phialellidae Russell, 1953	<i>Phialella quadrata</i> (Forbes, 1848)	P
Family Plumulariidae Agassiz, 1862	<i>Nemertesia ramosa</i> (Lamarck, 1816)	P
	<i>Plumularia obliqua</i> (Johnston, 1847)	P
	<i>Dynamena disticha</i> (Bosc, 1802)	P
Family Sertulariidae Lamouroux, 1812	<i>Sertularella crassicaulis</i> (Heller, 1868)	P
	<i>Sertularella polyzonias</i> (Linnaeus, 1758)	P
	<i>Sertularia perpusilla</i> Stechow, 1919	P
	<i>Orthopyxis integra</i> (MacGillivray, 1842)	P
Family Campanulariidae Johnston, 1836	<i>Orthopyxis mollis</i> (Stechow, 1919)	P
	<i>Clytia hemisphaerica</i> (Linnaeus, 1767)	P, M
	<i>Clytia linearis</i> (Thornely, 1900)	P, M
	<i>Obelia geniculata</i> (Linnaeus, 1758)	P, M

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Numerous species of hydroids were found attached to various hard substrates, either natural or human-made. Other species are known to have an epizootic habit, e.g. *Zanlea sessilis* was always associated with bryozoans, *Anthohebella parasitica* was present on cormoids of *Aglaophenia kirchenpaueri* and *A. pluma*, *Scandia gigas* and *Turritopsis dohrnii* were associated with sponges, *Lafoeina tenuis* was growing on *Bougainvillia muscus*, and *Phialella quadrata* was found on stems of *Sertularella polyzonias*. One species, belonging to the genus *Rhizogeton*

(Figure 2A), was mainly found during April, disappearing completely toward the summer. It was found always attached to shells of the limpet *Patella* sp. (Mollusca) invested by algae. As no gonophores could be observed, it cannot be reliably attributed to any known species. The polyps resemble *R. nudus* Broch, 1909 (see Schuchert 2004), but the latter species is restricted to cool Atlantic waters and its occurrence in the Mediterranean is somewhat unlikely, despite its presence has been indicated by Frascchetti et al. (2006).



**Figure 2.** A. – *Rhizogeton* sp., hydranth with propagula (arrowhead); B. – *Hydractinia minima*, medusa; C. – *Turritopsis dohrnii*, young medusa in subumbrellar view, slightly compressed; D. – *Coryne eximia*, young medusa, with ingested prey; E. – *Eirene viridula*, hydranth; F. – *Scandia gigas*, hydroid.

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Other species were preferentially associated with leaves of *Posidonia oceanica*, i.e. the hydroids *Plumularia obliqua*, *Dynamena disticha*, *Sertularia perpusilla*, *Orthopyxis integra*, *Obelia geniculata*, and the medusa *Eleutheria dichotoma*.

On the other hand, the occurrence of hydromedusae in the coastal plankton was highly dependent on submarine currents and seasons. Blooms were generally observed during April and May. Moreover, a number of undeterminable species was regularly found during the year. They were represented by immature, most probably recently-liberated specimens. Since no gonads were developed, and the number of marginal tentacles had not reached the characteristic

number for each species, no positive identifications could be made.

The presently-known number of Mediterranean hydrozoans is around 457 species, including 61 species of siphonophores (Bouillon et al. 2004). In conclusion, at least 10.6 % of the total number of Mediterranean species (siphonophores excluded) were found in La Ciotat and nearby areas. The present study improves our scientific knowledge of the local distribution of hydrozoan fauna in the Mediterranean Sea.

### Acknowledgements

I would like to thank the two reviewers for their helpful comments and constructive criticism of an earlier version of my manuscript.

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Received May 2007

Accepted June 2007

Published online August 2007